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(71) Applicant: **DAICEL CHEMICAL INDUSTRIES, LTD.**
Sakai-shi, Osaka 590 (JP)

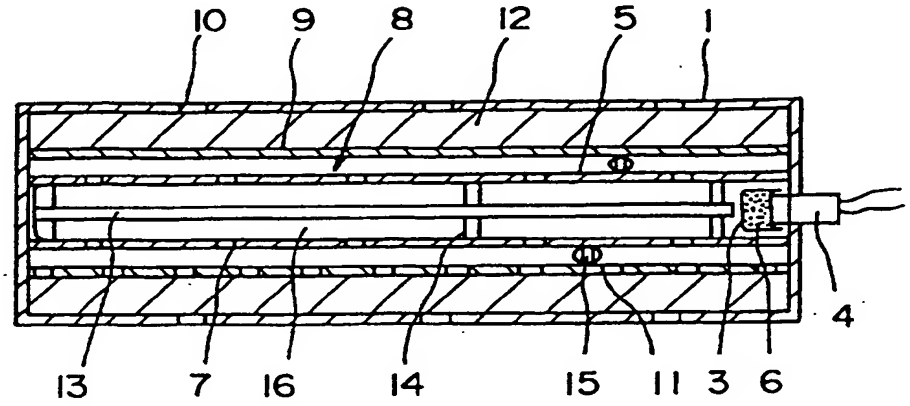
(72) Inventors:
- **NAKAJIMA, Yoshihiro**
  Himeji-shi 671-12 (JP)
- **ISHIDA, Hidetoshi**
  Hyogo 671-12 (JP)
- **SAKAMOTO, Satoshi**
  Osaka-shi Osaka 545 (JP)

(74) Representative: **Grünecker, Kinkeldey,**
Stockmair & Schwanhäusser
Anwaltssozietät
D-80538 München (DE)

(54) GAS GENERATOR FOR AIR BAG

(57) A gas generator for an air bag according to the present invention comprising a cylindrical housing, an inner cylindrical member disposed inside the housing, a central cylindrical member disposed inside the inner cylindrical member, a gas generating agent packed in an annular space between the central cylindrical member and the inner cylindrical member and an ignition means for igniting the gas generating agent, wherein the ignition means comprises in turn a transfer charge disposed at one end of the central cylindrical member, an igniter for igniting the transfer charge and a fire transfer member disposed close to the transfer charge at a central portion of the central cylindrical member, and wherein the fire transfer member is constituted by a non-explosive material and comprises a stick-like member extending along almost the full length of the central cylindrical member. The gas generator for an air bag according to the present invention is provided with an ignition structure which can generate uniform ignition energy in a longitudinal direction thereof.

Fig. 1



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Description

Field of the Invention:

This invention relates to an inflator for an air bag which protects an occupant of a vehicle against an impact, and more particularly to an ignition means for the inflator.

Brief Description of the Drawings:

Fig. 1 is a sectional view of this inflator.

Fig. 2 is a partial perspective view of a booster member applicable to this inflator.

Fig. 3 is a partial perspective view of the same portion of another embodiment.

Fig. 4 is a partial perspective view of the same portion of still another embodiment.

Fig. 5 is a partial perspective view of the same portion of a further embodiment.

Fig. 6 is a partial perspective view of the same portion of another embodiment.

Fig. 7 is a partial perspective view of the same portion of still another embodiment.

Fig. 8 is a sectional view of a conventional inflator.

Fig. 9 is a sectional view of another conventional inflator.

Fig. 10 is a sectional view of still another conventional inflator.

Referring to the drawings, a reference numeral 1 denotes a housing, 4 an igniter, 5 a central cylindrical member, 6 booster charge, 8 a combustion chamber, 9 a combustion cylinder (inner cylindrical member), 10 a gas outlet, 13 a booster member, 15 a gas generant, and 16 a clearance.

Relative Techniques:

There is a conventional inflator including a cylindrical housing having a gas outlet port, an inner cylindrical member provided in the housing and extending in the axial direction of the housing so as to define a combustion chamber, a gas generant packed in the combustion chamber, and an ignition means for igniting the gas generant.

Fig. 8 shows an example in which booster charge 31 constituting an ignition means is provided on the side of the interior of a cylindrical housing 32. The booster charge 31 is provided at one end portion of an inner cylindrical member 34 defining a combustion chamber 33. An igniter 36 is provided in contact with this booster charge 31. The combustion chamber 33 is filled with a gas generant 35.

An operation of the igniter 36 causes the booster charge 31 to be burnt, and the combustion of the booster charge 31 the gas generant 35 to be ignited.

Since the example of Fig. 8 is formed with the booster charge provided on one side of the interior of the housing, the ignition of the gas generant by the booster charge is limited to the portion of the burning gas generant which is around the booster charge.

An inflator in which a region for providing booster charge is extended in the axial direction as shown in Fig. 9 has been proposed. In this inflator, a central cylindrical member, i.e. a tubular container 37, which extends in the axial direction of a housing, is provided in an inner cylindrical member 34, and booster charge 31 is packed in the this tubular container 37. A gas generant 35 is packed in an annular space formed between the tubular container 37 and inner cylindrical member 34.

However, in this example, the combustion is transmitted from an end portion of the booster charge, so that it is impossible to generate ignition energy therein over the whole length thereof at once.

Fig. 10 shows an example formed by providing a structure, which is identical with that shown in Fig. 9, with a detonating powder cord 38 in a tubular container 37 filled with booster charge 31, so as to solve this problem. Since the powder cord is burnt very speedily as compared with the booster charge, the ignition energy can be generated therein over the whole length thereof substantially at the same time.

Since the inflator shown in Fig. 10 includes booster charge, a tubular container filled with the booster charge, and a detonating powder cord provided in the tubular container, the construction thereof becomes complicated, and the assembling of the inflator is very difficult. The tubular container is an elongated container. In order to install the detonating powder cord in this tubular container, it is necessary that the detonating powder cord be placed in the central portion of the interior of the container first, and that the booster charge be then packed uniformly in the tubular container so that the detonating powder cord does not deviate from the central portion. These operations are very difficult, and have to be carried out carefully. Therefore, highly advanced techniques are required, and the inflator manufacturing operation takes much time and costs much money.

When an ignition operation is carried out with the detonating powder cord deviating from the central portion, uniform ignition energy cannot be obtained.

Disclosure of the Invention:

The present invention aims at providing a novel inflator for air bags which solves these problems encountered in the above-described conventional techniques.

The inflator for air bags according to the present invention has a cylindrical housing provided with a gas outlet port, an inner cylindrical member provided in the housing and extending in the axial direction thereof so as to define a combustion chamber, a central cylindrical member provided in the inner cylindrical member and extending in the axial direction of the housing, a gas generant packed in an annular space formed between the central cylindrical member and inner cylindrical member, and an ignition means for igniting the gas generant, as generated by the gas generant on receiving an impact

being introduced into an air bag to protect an occupant of a vehicle against the impact,

characterized in that the ignition means comprises booster charge provided in one end portion of the central cylindrical member, an igniter for igniting the booster charge, and a booster member provided in the part of a central portion of the central cylindrical member which is close to the booster charge, the booster member being made of a nonexplosive material so as to constitute a rod type member extending over substantially the whole length of the central cylindrical member.

The ignition means in the inflator according to the present invention includes a booster member comprising a rod type member extending over substantially the whole length of the central cylindrical member. This booster member can be made of, for example, magnesium, polyfluoroethylene such as Teflon (name of a commercial product), and a nonexplosive material containing Viton as a main component. The Viton is the name of a commercial product of the du Pont, which is a rubber-like copolymer containing fluorine atoms in the molecules. According to the present invention, ignition energy is generated by this booster member. Since this booster member is provided in the central portion of the central cylindrical member, an annular clearance is formed around the booster member. The flames of the booster charge pass through this clearance, whereby a circumferential portion of the booster member can be ignited over the whole length thereof substantially at the same time. Consequently, the booster member is burnt, and lengthwise uniform ignition energy is generated.

Since the inflator according to the present invention is constructed as described above, the effect which will be described below is obtained.

The booster member provided in this inflator can generate lengthwise uniform ignition energy. Therefore, the ignition of the gas generant is not limited to a certain region thereof but it is possible that the ignition thereof occurs in a wide region thereof at once. This enables the inflator to always display a stable gas generating capability.

Although the heating value of the booster member provided in this inflator is substantially equal to that of generally used booster charge, the sensitivity of the former to heat and impacts is lower than that of the latter. Accordingly, the safety of the inflator with respect to the handling and manufacturing of the same is improved.

According to the present invention, an operation for manufacturing a tubular container which is difficult to manufacture due to its thin-walled elongated structure, and which is used to pack booster charge therein, and an assembling operation for setting booster charge and a detonating powder cord in the tubular container, which is very difficult and requires carefulness, can be disused. The inflator according to the present invention can be obtained by inserting a rod type booster member in a simply-formed central cylindrical member, and, the manufacturing and assembling of the parts of the inflator are carried out easily and safely.

Embodiments:

An embodiment of the present invention will now be described with reference to the drawings. Fig. 1 is a sectional view of this inflator. This inflator has a both end-closed cylindrical housing 1. The housing 1 has at an occupant-side region thereof a plurality of circular gas outlet ports 10 from which a combustion gas of a gas generant is discharged. The housing 1 is provided therein with an inner cylindrical member, i.e. a combustion cylinder 9. This combustion cylinder 9 has a cylindrical body, which is provided with axially spaced gas discharge holes 11 over the whole circumference thereof. This combustion cylinder 9 is provided coaxially with the housing 1 and extends up to both end portions thereof.

The combustion cylinder 9 is provided therein with a central cylindrical member 5 extending coaxially with and over the whole length of the combustion cylinder 9, and an annular combustion chamber 8 is formed between the central cylindrical member 5 and combustion cylinder 9. The combustion chamber 8 is filled with a gas generant 15 comprising a plurality of pellets, and a filter 12 is provided on the outer side of the combustion cylinder 9 so as to surround these pellets.

In one end portion of the central cylindrical member 5, an igniter 4 operated by a signal from a sensor (not shown), and booster charge 6 ignited by this igniter 4 are packed. The booster charge 6 is held in an booster charge container 3, and this booster charge container 3 and igniter 4 are in contact with each other. The central cylindrical member 5 is provided with a booster member 13 in the portion of the interior thereof which is close to the booster charge 6. The booster member 13 is formed in the shape of a cross-sectionally circular rod, and provided in the central portion of the central cylindrical member 5, with the intermediate portion and both end portions thereof supported on a support member 14, the booster member 13 extending over substantially the whole length of the central cylindrical member 5. Between the booster member 13 and central cylindrical member 5, an annular clearance 16 is formed over the whole length of the booster member 13. This booster member 13 comprises magnesium, Teflon (name of a commercial product), and a nonexplosive material containing Viton as a main component.

The central cylindrical member 5 is provided with a plurality of openings 7 from which the flames of the booster member 13 are ejected to the outside, and these openings 7 are formed in a uniformly distributed manner in the wall of the central cylindrical member.

The booster member sufficiently serves to achieve the object of the present invention even when it comprises a cross-sectionally circular rod. It is preferable that the booster member has a more complicated cross-sectional shape so as to increase the combustion speed and side surface area thereof. The booster member has, for example, a hollow and radially extending projections.

Figs. 2-7 show various shapes of booster members applicable to the inflator according to the present invention. Fig. 2 shows an example capable of being burnt from both the inner and outer surfaces 17, 18 thereof. Figs. 3-5 show shaped examples having an increased surface area. Figs. 6 and 7 show examples in which flame passages 19, 20 are formed inside so that the booster members can be burnt from the inner side thereof as well.

When an impact is detected by a sensor, a signal representative of the same is sent to the igniter 4, so that the igniter 4 is operated, whereby the booster charge 6 is ignited to generate high-temperature flames. The flames pass through the clearance 16 formed around the outer circumference of the booster member 13, and ignite the outer circumference of the booster member 13 over the whole length thereof substantially at the same time. Consequently, the booster member 13 is burnt and lengthwise uniform ignition energy is generated. This ignition energy is ejected from the openings 7 of the central cylindrical member 5 to ignite the portions of the gas generant 15 which are in the regions corresponding to the openings 7. As a result, the gas generant 15 is burnt to generate a high-pressure combustion gas. This combustion gas flows into a filter chamber through the openings 11, and, while the combustion gas passes through the filter 12, the combustion residue is removed. The gas ejected from the gas outlet port 10 flows into an air bag (not shown), which expands suddenly so as to protect an occupant of a vehicle against the impact.

Claims

1. An inflator for air bags, having a cylindrical housing provided with a gas outlet port(s), an inner cylindrical member provided in said housing and extending in the axial direction thereof so as to define a combustion chamber, a central cylindrical member provided in said inner cylindrical member and extending in the axial direction of said housing, a gas generant packed in an annular space formed between said central cylindrical member and said inner cylindrical member, and an ignition means for igniting said gas generant, a gas generated by said gas generant an receiving an impact being introduced into an air bag to protect an occupant of a vehicle against the impact,

   characterized in that said ignition means comprises booster charge provided in one end portion of said central cylindrical member, an igniter for igniting said booster charge, and a booster member provided in the part of a central portion of said central cylindrical member which is close to said booster charge, said booster member being made of a non-explosive material and comprising a rod type member extending over substantially the whole length of said central cylindrical member.

2. An inflator according to Claim, wherein said booster member comprises magnesium, polyfluoroethylene and a fluororubber-like copolymer.

3. An inflator according to Claim 1, wherein said central cylindrical member has a plurality of openings.

4. An inflator according to Claim 1, wherein said booster member comprises a cross-sectionally circular rod, or such a rod having a hollow therein, or such a rod having radially extending projections thereon.

Fig. 1

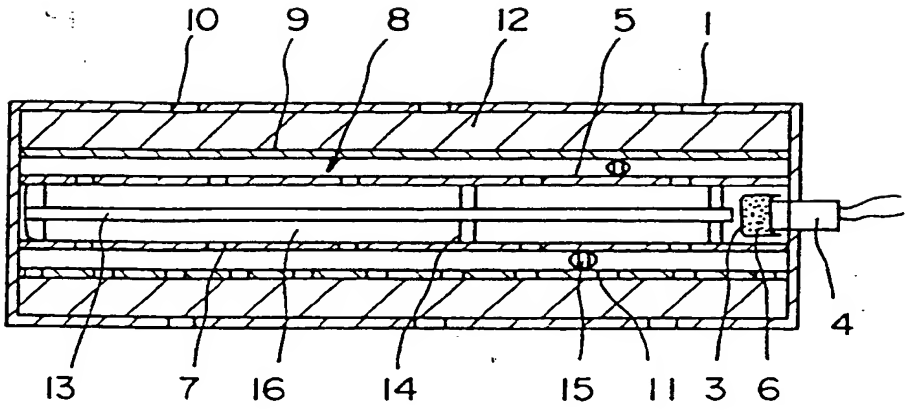


Fig. 2

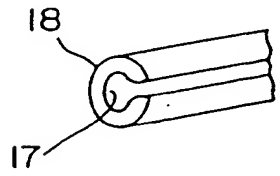


Fig. 3

Fig. 4

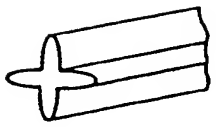


Fig. 5

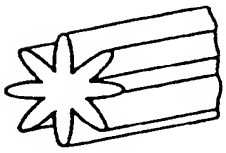


Fig. 6

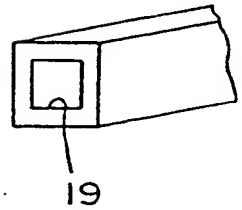


Fig. 7

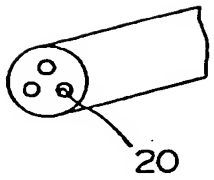


Fig. 8

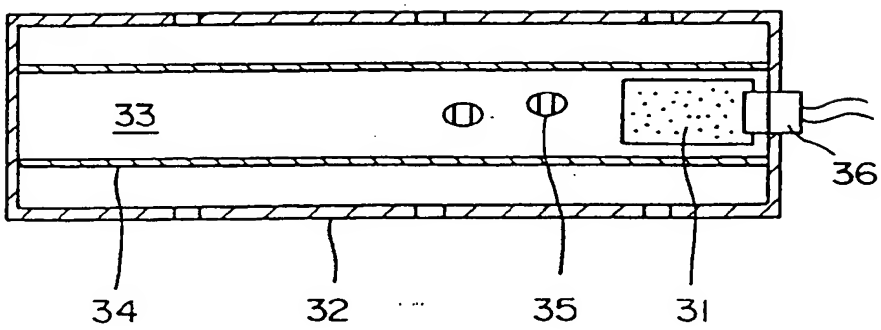


Fig. 9

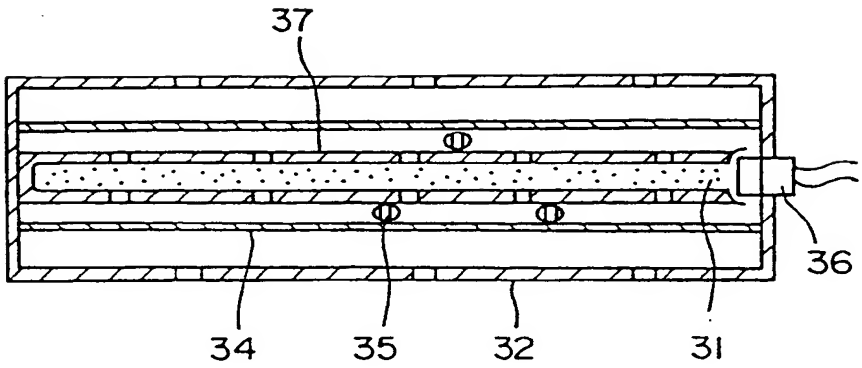
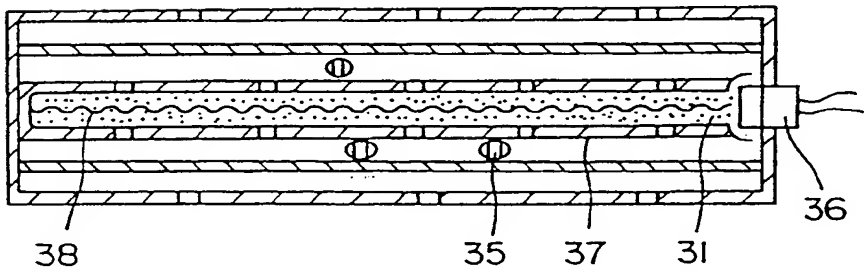


Fig.10



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP95/00099

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl^6 B60R21/26

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Int. Cl^6 B60R21/26

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho 1926 - 1994
Kokai Jitsuyo Shinan Koho 1971 - 1994

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP, A, 63-176387 (Daicel Chemical Industries, Ltd.), July 20, 1988 (20. 07. 88), Figs. 3 and 4 (Family: none)	1, 3, 4
X Y	JP, A, 4-85149 (Sumitomo Electric Industries, Ltd.), March 18, 1992 (18. 03. 92), Fig. 1 (Family: none)	1, 4 3
X Y	JP, A, 2-155858 (Nippon Koki Co., Ltd., Honda Motor Co., Ltd.), June 14, 1990 (14. 06. 90), Description of line 13, upper left column to line 16, upper right column, page 4, Fig. 8 & US, A, 5062367	1, 3 2
X	JP, A, 55-110642 (Thiokol Corp.), August 26, 1980 (26. 08. 80), Figs. 1 and 2 & EP, B1, 12626 & US, A, 4296284	1, 3, 4

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
April 17, 1995 (17. 04. 95)	May 16, 1995 (16. 05. 95)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP95/00099

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP, A, 3-75289 (Nippon Koki Co., Ltd.), March 29, 1991 (29. 03. 91), Description of claim 3, Fig. 1 (Family: none)	1, 2
Y	JP, A, 3-174210 (Nippon Koki Co., Ltd.), July 29, 1991 (29. 07. 91), Lines 8 to 20, upper left column, page 4 (Family: none)	2
X	JP, A, 5-213148 (Asahi Chemical Industry Co., Ltd.), August 24, 1993 (24. 08. 93),	1
Y	Lines 5 to 6, right column, page 4, Fig. 1 (Family: none)	2

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